



⑫

EUROPEAN PATENT SPECIFICATION

④⑤ Date of publication of patent specification :
17.02.93 Bulletin 93/07

⑤① Int. Cl.⁵ : **E04G 17/14, E04G 11/12**

②① Application number : **90306674.4**

②② Date of filing : **19.06.90**

⑤④ **Modular concrete form.**

③⑩ Priority : **23.06.89 US 370757**

④③ Date of publication of application :
27.12.90 Bulletin 90/52

④⑤ Publication of the grant of the patent :
17.02.93 Bulletin 93/07

⑥④ Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

⑤⑥ References cited :
EP-A- 0 017 630
EP-A- 0 233 643
DE-A- 3 545 426
US-A- 1 552 334
US-A- 3 751 790

⑦③ Proprietor : **Lee, Yuan-Ho**
No. 851, Chung-San Road Nan-Pao Tsun
Kuei-Jen Hsian Tainan Hsieng (TW)

⑦② Inventor : **Lee, Yuan-Ho**
No. 851, Chung-San Road Nan-Pao Tsun
Kuei-Jen Hsian Tainan Hsieng (TW)

⑦④ Representative : **Jackson, Peter Arthur et al**
GILL JENNINGS & EVERY, Broadgate House,
7 Eldon Street
London EC2M 7LH (GB)

EP 0 404 513 B1

Note : Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

This invention relates to a form assembly for forming a concrete structure.

It is now a common practice to assemble modular form panels to a large form board which can be stripped, entirely from a formed concrete structure and which can be used repeatedly to form similar concrete structures without the need to disassemble and reassemble the form board. Generally, such form panels include a plate member and reinforcement members connected to the back of the plate. US-A-2,544,297 discloses a foldable form including a steel panel and a plurality of longitudinal and transverse reinforcement struts which are connected to the panel for backing purposes by a time-consuming welding process. Well known steel-ply panels which are manufactured by Symon Corporation include rectangular plywood panels arranged in edge-to-edge contiguity, and a rectangular reinforcing frame is used to back the plywood panels. Usually, in conventional form boards, thick panels are utilized to increase the strength of the form panel or minimize the deflection of the panel, thereby increasing the weight of the form assembly. Furthermore, the backing members to reinforce conventional form panels are usually welded to the form panels so that the variable dimension of form panels is an integral multiple of the dimension of standard form panels, thereby limiting the variation in dimension of the form panels.

US-A-4290985 (corresponding to EP-A-0 017 630) discloses a form assembly comprising form plates arranged in edge-to-edge contiguity, each of the plates having a pair of longitudinal sides and a pair of transverse sides; and trussed backing members extending between the transverse sides; and according to the present invention, such a form assembly is characterised by fastening means provided along the longitudinal sides releasably to fasten adjacent pairs of the form plates; and reinforcement channel pieces attached detachably to the form plates along the transverse sides; the trussed backing members extending longitudinally between the channel pieces, each of the trussed backing members having two opposite joint ends detachably connected to the channel pieces wherein each of the channel pieces includes a plate member, two opposite longitudinal flanges extending from two opposite sides of the plate member of the channel piece, one of the opposite longitudinal flanges abutting the form plate for connection thereto, and two inward flanges respectively extending inwardly from the longitudinal flanges and having screw threaded holes therein, wherein each of the channel pieces includes opposite transverse flanges extending from the plate member of the channel pieces between the longitudinal flanges.

With this construction, the reinforcement backing members are not welded to the form plates. The

modular plates can be connected directly and detachably to other plates and the modular reinforcement backing members can be connected detachably to the plates and other backing members so that the backing members can be detached easily from the plate unit after the modular units are assembled together. The invention permits the plates to be cut so that the dimensions thereof can be changed from a standard size without the need to cut the backing member for a next forming operation which would require the setting up of a form which is different from that previously used.

Modular reinforcement backing members may be used which can be assembled easily to back panel plates of various sizes. The modular reinforcement backing members may contribute different desired strengths to panel plates for different structures by changing the number of the backing members to be attached to the panel plates.

The present exemplary preferred embodiment will be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a form assembly according to the present invention;

Figure 2 is an exploded view showing a portion of the form assembly;

Figure 3 is a perspective view showing two adjacent panel plates;

Figure 4 shows a looped member of a fastener used to fasten two adjacent panel plates;

Figure 5 shows a key member to cooperate with the looped member;

Figures 6 & 7 show how the two panel plates are fastened together;

Figure 8 shows a fragmentary sectional view taken along line I-I of Fig. 1;

Figure 9 shows a fragmentary sectional view taken along line II-II of Figure 1; and

Figure 10 shows a fragmentary sectional view taken along line III-III of Figure 1.

Referring to Figure 1, a form board 10 according to the present invention includes panel plates 20 and a backing frame 30 which is constituted of a trussed backing frame 31 and channel members 32, 33.

As shown in Figure 2, the trussed backing frame 31 is constituted of modular trussed backing members 34 and connectors 35. Each upper or lower channel member 32 or 33 has a plate member 36, two opposite longitudinal backward flanges 40, 41, two opposite flanges 42, 43 extending inward from the backward flanges 40, 41 respectively, and two opposite transverse flanges 37 and 38. Screw holes 39 are provided in the flanges 37, 38, screw holes 44 are provided in the flanges 42, 43, and screw holes 46 are provided in the flange 40. A side flange 45 extends from the backward flange 40 and is coplanar with the plate member 36.

Each trussed backing member 34 includes four

parallel angled bars 341 and 342 and a plurality of inclined span rods 343 of rectangular cross-section welded to the angled bars 341 and 342 therebetween. Upper and lower end pieces 344 and 345 are welded to two opposite ends of the angled bars 341 and 342. Screw holes 346 are provided in the end pieces 344 and 345 so that the end pieces 344 and 345 can be fastened to the channel pieces 32 and 33.

Connectors 35 are used to interconnect detachably the trussed backing members 34 so that the length of the trussed backing members 34 can be reduced or increased as desired. Each connector 35 includes two opposite plates 351 and 352 and a web member 353 interconnecting the plates 351 and 352. The plates 351 and 352 are provided with flanges 354 and 355 having screw holes 356 so that the flanges 354 and 355 can be screwed to the end plates of the trussed backing member 34. The connector 35 may be a one piece member which is formed by casting.

Each panel plate 20 can be connected detachably to the other panel plate 20. Referring to Figure 3, each panel 20 is provided with ribs 22 respectively at transverse sides thereof, and screw holes 23 are provided in the ribs 22 to permit channel members 32, 33 to be fastened to them by means of screws.

Two adjacent panels 20 can be fastened together by means of a fastener means. Referring to Figures 4, 5, 6 and 7 in combination with Figure 4, the fastener means includes looped members 24 which are provided at intervals along longitudinal sides on the back of the form panels 20. Each looped member 24 on one of the panels 20 is respectively aligned with the looped members 24 on the adjacent panel 20.

Each looped member 24 has a substantially planar engagement member 241 with an inner engagement face 241a and two flanks 242 and 243 which are welded to the back face of each form panel. The engagement member 241 and the flanks 242 and 243 of each looped member define an opening 244 with the back face of the form panel.

The fastener means used to fasten the form panels further includes key members 25 each having an insert rod portion 251 to be inserted in two aligned looped members 24 and a handle rod portion 252 which forms an angle with the insert rod portion 251. The insert rod portion 251 has a substantially rectangular cross-section and has a pair of first opposed longitudinal faces 253, and a pair of second opposed longitudinal faces 254. The length between the first opposed faces 253 is smaller than that between the engagement face 241a and the back face of the form panel 20 so that the key rod portion 251 can be inserted into aligned looped members 24. The length between the second opposed faces 254 is greater than that between the engagement face 241a and the back face of the form panel 20 so that the faces 254 continuously engage respectively with the engagement face 241a of the looped member 24 and the

back face of the form panel 20 when the insert rod portion 251 is turned 90 degrees after being inserted. Preferably, the opposed faces 254 are curved slightly so that the key member 25 can be turned smoothly. The panel plates are fastened together firmly when the key members 25 are respectively inserted into two aligned looped members 24 and turned 90 degrees.

In assembly, the panel plates 20 are arranged in edge-to-edge contiguity and fastened by means of looped members 24 and key members 25. Channel pieces 32, 33 are screwed to the side portions of the panel plates, and then the trussed backing members 34 are screwed to the channel pieces 32, 33. If it is necessary to increase the length of the trussed backing members additional trussed backing members can be connected to the existing trussed backing members by means of connectors 35.

Figures 8 to 10 show the connection between the components of the assembly embodying the present invention. Referring to Figure 8 in combination with Figure 1, channel piece 32 is attached to panel plate 20 by screwing the flange 40 thereof to the rib 22 by means of a screw 51. The screw 51 does not thread through the panel plate 20. The side flange 45 which has a thickness substantially similar to that of the rib 22 bears against the panel plate 20 so that the channel piece 32 is secured firmly to the plate 20 without swinging.

Referring to Figure 9 in combination with Figure 1, channel piece 32 is connected to an adjacent auxiliary channel piece 47 which is used to extend the length of the channel piece 32 by abutting transverse flanges 37 and 38 against one another and fastening them together by means of screws 52.

Referring to Figure 10 in combination with Figure 1, the trussed backing member 34 is connected to the connecting member 35 by abutting the end piece 345 thereof against the flange 354 of the connecting member 35 and fastening them to one another by means of screws 55.

The above described modular components can be constructed as desired to form assemblies having different dimensions. If an assembled form is required to be used for forming a structure having a dimension which cannot be formed with that form as presently assembled, one can easily disassemble the form and the panel plate can be cut to a non-standard size without the need to cut backing members. After the altering of the panel plate, backing members can be re-attached to the cut panel plate in their proper positions.

It can be noted that the spacing between the trussed backing members can be varied, that is to say, the degree of the reinforcement provided by the backing members is variable, so that the form of the present invention can be obtained with different strengths according to the different requirements of

forms, by varying both the number of the trussed backing members attached to the panel plates and the spacing between the trussed backing members. In practice, channel pieces 32, 33 having a length of 640mm and a spacing of 440 mm between two trussed backing members 34 provide a good backing strength. The trussed backing members 34 are arranged in standard lengths of 120cm, 140cm and 160cm. Therefore a variety members can be obtained from different combinations of standard lengths.

Claims

1. A form assembly comprising form plates (20) arranged in edge-to-edge contiguity, each of the plates (20) having a pair of longitudinal sides and a pair of transverse sides; and trussed backing members (34) extending between the transverse sides; characterised by fastening means (24,25) provided along the longitudinal sides releasably to fasten adjacent pairs of the form plates (20); and reinforcement channel pieces (32,33) attached detachably to the form plates (20) along the transverse sides; the trussed backing members (34) extending longitudinally between the channel pieces (32,33), each of the trussed backing members (34) having two opposite joint ends detachably connected to the channel pieces (32,33) wherein each of the channel pieces (32,33) includes a plate member (36), two opposite longitudinal flanges (40,41) extending from two opposite sides of the plate member of the channel piece, one of the opposite longitudinal flanges (40,41) abutting the form plate (20) for connection thereto, and two inward flanges (42,43) respectively extending inwardly from the longitudinal flanges (40,41) and having screw threaded holes therein, wherein each of the channel pieces includes opposite transverse flanges (37,38) extending from the plate member of the channel pieces between the longitudinal flanges (40,41).
2. A form assembly as claimed in claim 1, wherein each of the trussed backing members (31) is provided with two opposite transverse members (344,345) for abutting the inward flanges (42,43) of the channel pieces (32,33).
3. A form assembly as claimed in claim 2, further comprising connecting pieces (35) to interconnect the trussed backing members (34), the connecting pieces (35) being detachably connected to the trussed backing members (34), wherein each of the connecting pieces (35) is a one-piece member having two spaced parallel plate members (351,352) and a transverse web (353) inter-

connecting the spaced parallel plate members (351,352), the spaced parallel plate members (351,352) being provided with opposite right-angled flanges (354,355) abutting with the end plate members (344,345) for connection thereto.

4. A form assembly as claimed in any one of the preceding claims, wherein the fastening means includes a plurality of looped members (24) projecting from each of the form plates (20) adjacent to the longitudinal sides, the looped members (24) of each of the form plates (20) being respectively aligned with the looped members (24) of an adjacent form plate (20), each of the looped members having an engagement face (241) spaced apart from the form plate (20) and two spaced apart opposed side flanks (242,243) connected securely to the form plate on two sides of the engagement face (241), the distance between the flanks (242,243) being greater than that between the engagement face (241) and the form plate (20), and key members (25) each having an insert rod portion (251) to be inserted in at least two aligned looped members and a handle rod portion (252) which forms an angle with the insert rod portion, the insert rod portion (251) having a pair of first opposed longitudinal faces (253), and a pair of second opposed longitudinal faces (254), the distance between the first opposed faces (253) being smaller than the distance between the engagement face (241) and the form plate (20) so that the insert rod portion (251) can be inserted into aligned ones of the looped members (24), and the distance between the second opposed faces (254) being greater than the distance between the engagement face (241) and the form plate (20) to provide frictional engagement when the insert rod portion (251) is turned after being inserted.
5. A form assembly as claimed in claim 4, wherein the insert rod portion (251) has a substantially rectangular cross-section, and the second opposed faces (254) are convex in section transversely to the length of the insert rod portion (251).

Patentansprüche

1. Schalungszusammenstellung mit Schalungsplatten (20), die randseitig aneinander anstoßend angeordnet sind, wobei jede der Platten (20) ein Paar Längsseiten und ein Paar Querseiten aufweist und sich Fachwerk-Hinterlegungsteile (34) zwischen den Querseiten erstrecken; **gekennzeichnet** durch Befestigungsmittel (24, 25), die entlang der Längsseiten zur lösbaren gegensei-

tigen Befestigung benachbarter Paare von Schalungsplatten (20) vorgesehen sind, und durch kanalförmige Verstärkungsstücke (32, 33), die an den Schalungsplatten (20) entlang der Querseiten lösbar befestigt sind, wobei sich die Fachwerk-Hinterlegungsteile (34) in Längsrichtung zwischen den kanalförmigen Stücken (32, 33) erstrecken, jedes Fachwerk-Hinterlegungsteil (34) zwei einander gegenüberliegende Verbindungsenden aufweist, die mit den kanalförmigen Stücken (32, 33) lösbar verbunden sind, jedes kanalförmige Stück (32, 33) ein Plattenteil (36), zwei einander gegenüberliegende Längsflansche (40, 41), die sich von zwei einander gegenüberliegenden Seiten des Plattenteils des kanalförmigen Stücks erstrecken, wobei einer der einander gegenüberliegenden Längsflansche (40, 41) gegen die Schalungsplatte (20) zur Verbindung mit dieser anliegt, und zwei einwärts gerichtete Flansche (42, 43), die sich von den Längsflanschen (40, 41) aus einwärts erstrecken und Schraubgewindelöcher aufweisen, umfaßt, wobei jedes der kanalförmigen Stücke einander gegenüberliegende Querflansche (37, 38) aufweist, die sich von dem Plattenteil der kanalförmigen Stücke ausgehend zwischen den Längsflanschen (40, 41) erstrecken.

2. Schalungszusammenstellung nach Anspruch 1, **dadurch gekennzeichnet**, daß jedes Fachwerk-Hinterlegungsteil (31) mit zwei einander gegenüberliegenden Querteilen (344, 345) zur Anlage gegen die Innenflansche (42, 43) der kanalförmigen Stücke (32, 33) ausgestattet ist.

3. Schalungszusammenstellung nach Anspruch 2 des weiteren mit Verbindungsstücken (35) zur gegenseitigen Verbindung der Fachwerk-Hinterlegungsteile (34), wobei die Verbindungsstücke (35) mit den Fachwerk-Hinterlegungsteilen (34) lösbar verbunden sind, **dadurch gekennzeichnet**, daß jedes Verbindungsstück (35) ein einstückiges Teil mit zwei in Abständen angeordneten, parallelen Plattenteilen (351, 352) und einem Quersteg (53) ist, der die in Abständen angeordneten, parallelen Plattenteile (351, 352) miteinander verbindet, wobei die in Abständen angeordneten, parallelen Plattenteile (351, 352) mit einander gegenüberliegenden, rechtwinkligen Flanschen (354, 355) ausgestattet sind, die gegen die Endplattenteile (344, 345) zur Verbindung mit diesen anliegen.

4. Formzusammenstellung nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Befestigungsmittel eine Vielzahl von Bügelteilen (34) aufweisen, die von jeder der Schalungsplatten (20) in der Nähe der

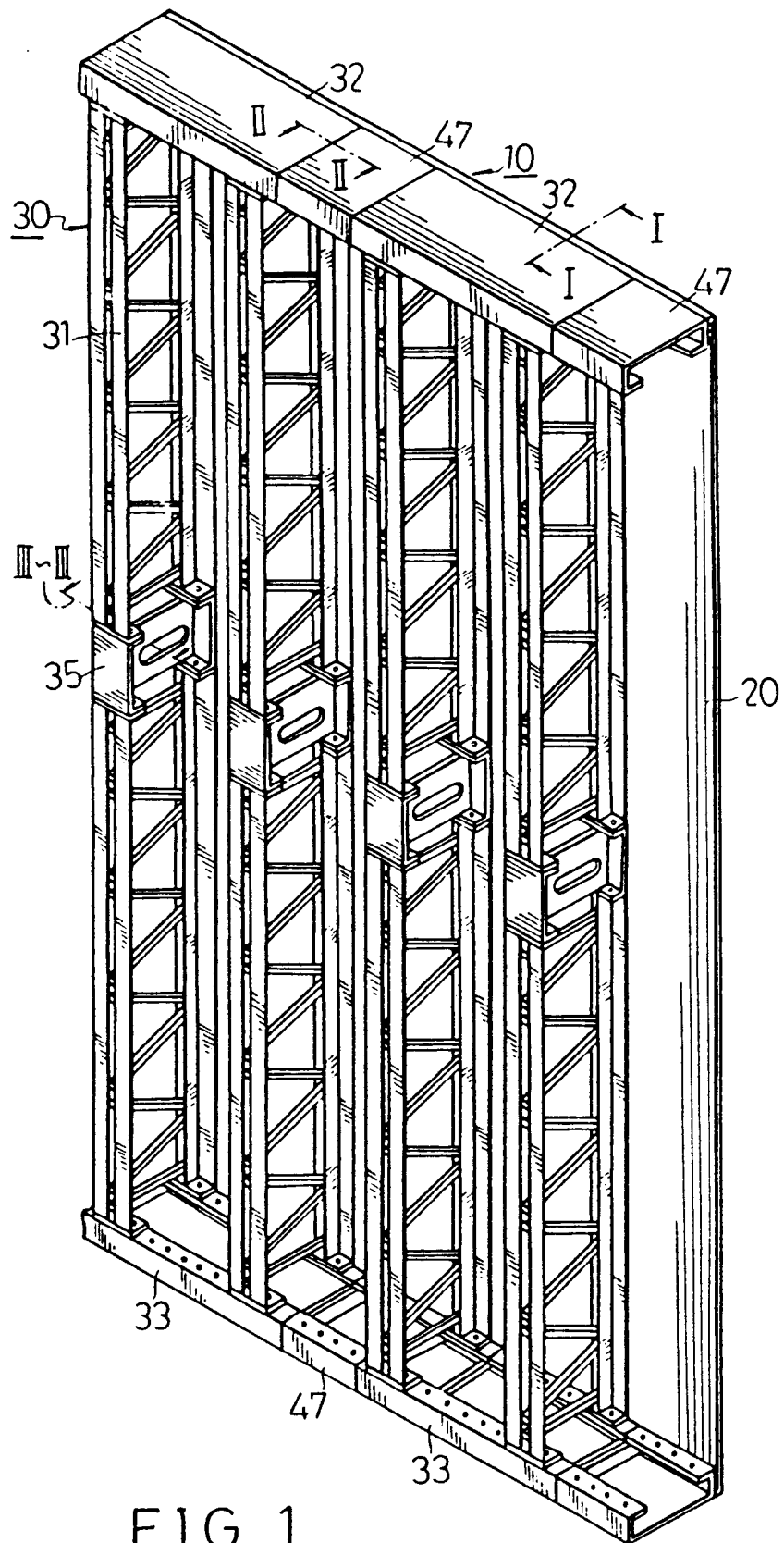
Längsseiten vorstehen, wobei die Bügelteile (24) jeder Schalungsplatte (20) mit den Bügelteilen (24) einer benachbarten Schalungsplatte (20) fluchten, jedes der fluchtenden Bügelteile eine Anlagefläche (241) in einem Abstand von der Schalungsplatte (20) und zwei in Abständen voneinander angeordnete und einander gegenüberliegende Seitenflanken (244, 243) aufweist, die mit der Schalungsplatte an zwei Seiten der Berührungsfläche (241) fest verbunden sind, wobei der Abstand zwischen den Flanken (242, 243) größer als derjenige zwischen der Berührungsfläche (241) und der Schalungsplatte (20) ist, und Keilteile (25) je mit einem Einsatz-Stangenabschnitt (251), der in mindestens zwei miteinander fluchtende Bügelteile einzusetzen ist, und einem Griff-Stangenabschnitt (252), der einen Winkel mit dem Einsatz-Stangenabschnitt bildet, wobei der Einsatz-Stangenabschnitt (251) ein Paar erste einander gegenüberliegende Längsflächen (253) und ein Paar zweite einander gegenüberliegende Längsflächen (254) aufweist, der Abstand zwischen den ersten einander gegenüberliegenden Flächen (253) kleiner als der Abstand zwischen der Berührungsfläche (241) und der Schalungsplatte (20) ist, so daß der Einsatz-Stangenabschnitt (251) in miteinander fluchtende Bügelteile (24) eingesetzt werden kann, und wobei der Abstand zwischen den zwei gegenüberliegenden Flächen (254) größer als der Abstand zwischen der Berührungsfläche (41) und der Schalungsplatte (20) ist, um für eine reibende Berührung zu sorgen, wenn der Einsatz-Stangenabschnitt (251) nach dem Einsetzen verschwenkt wird.

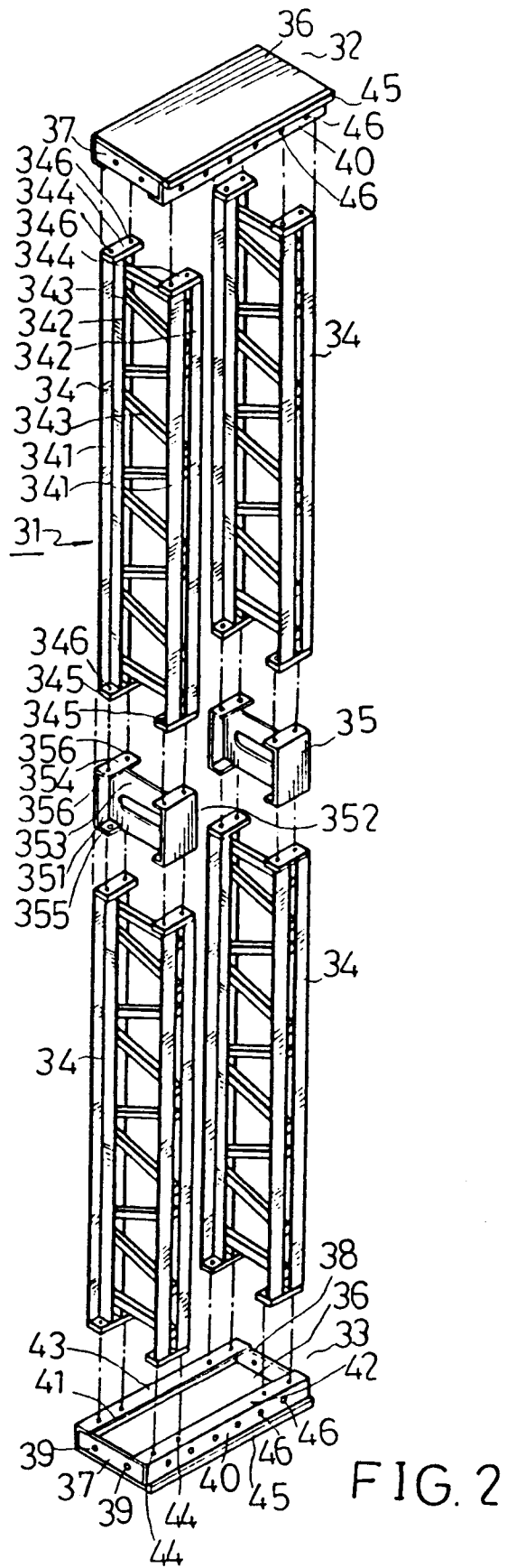
5. Schalungszusammenstellung nach Anspruch 4, **dadurch gekennzeichnet**, daß der Einsatz-Stangenabschnitt (251) einen im wesentlichen rechteckigen Querschnitt aufweist und die zwei einander gegenüberliegenden Flächen (254) im Querschnitt quer zur Länge des Einsatz-Stangenabschnitts (251) konvex sind.

Revendications

1. Ensemble de coffrage comprenant des plaques (20) de coffrage placées bord à bord et contiguës, chacune des plaques (20) ayant deux côtés longitudinaux et deux côtés transversaux, et des organes renforcés d'appui (34) disposés entre les côtés transversaux, caractérisé par des dispositifs de fixation (24, 25) placés le long des côtés longitudinaux afin qu'ils fixent temporairement les paires adjacentes de plaques (20) de coffrage, et des organes de renforcement en U (32, 33) fixés de façon amovible aux plaques (20) de cof-

- frage le long des côtés transversaux, les organes renforcés d'appui (34) étant disposés longitudinalement entre les organes en U (32, 33), chaque organe renforcé d'appui (34) ayant deux extrémités opposées de raccordement qui sont raccordées de manière amovible aux organes en U (32, 33), chacun des organes en U (32, 33) comprenant un organe (36) en forme de plaque, deux joues longitudinales opposées (40, 41) partant des deux côtés opposés de l'organe en forme de plaque de l'organe en U, une des joues longitudinales opposées (40, 41) étant en butée contre la plaque (20) de coffrage pour être raccordée à celle-ci, et deux joues (42, 43) tournées vers l'intérieur et dirigées respectivement vers l'intérieur depuis les joues longitudinales (40, 41) et ayant des trous de vissage, chaque organe en U comprenant des joues transversales opposées (37, 38) partant de l'organe en forme de plaque des organes en U entre les joues longitudinales (40, 41).
2. Ensemble de coffrage selon la revendication 1, dans lequel chacun des organes renforcés d'appui (31) a deux organes transversaux opposés (344, 345) destinés à être en butée contre les joues internes (42, 43) des organes en U (32, 33).
3. Ensemble de coffrage selon la revendication 2, comprenant en outre des pièces (35) de raccordement des organes renforcés d'appui (34), les pièces de raccordement (35) étant raccordées de façon amovible aux organes renforcés d'appui (34), et chaque pièce de raccordement (35) est un organe en une seule pièce ayant deux organes en forme de plaques parallèles distants (351, 352) et une joue transversale (353) qui raccorde les organes parallèles distants (351, 352) en forme de plaques, les organes parallèles distants en forme de plaques (351, 352) ayant des joues opposées perpendiculaires (354, 355) qui sont en butée contre les organes (344, 345) formant les plaques d'extrémité pour être raccordées à ceux-ci.
4. Ensemble de coffrage selon l'une quelconque des revendications précédentes, dans lequel les dispositifs de fixation comprennent plusieurs organes (24) en forme de boucles dépassant de chacune des plaques de coffrage (20) près des côtés longitudinaux, les organes en forme de boucles (24) des plaques de coffrage (20) étant alignés sur les organes en forme de boucles (24) d'une plaque adjacente de coffrage (20), chaque organe en forme de boucle ayant une face de contact (241) qui est à une certaine distance de la plaque de coffrage (20) et deux ailes latérales distantes opposées (242, 243) fermement raccordées à la plaque de coffrage des deux côtés de la face de coopération (241), la distance comprise entre les ailes (242, 243) étant supérieure à la distance comprise entre la face de coopération (241) et la plaque de coffrage (20), et des clavettes (25) ayant chacune une partie (251) de tige destinée à être introduite dans au moins deux organes alignés en forme de boucles, et une partie (252) de tige de poignée qui fait un angle avec la partie de tige d'introduction, la partie de tige d'introduction (251) ayant deux premières faces longitudinales opposées (253) et de secondes faces longitudinales opposées (254), la distance comprise entre les premières faces opposées (253) étant inférieure à la distance comprise entre la face de coopération (241) et la plaque de coffrage (20) afin que la partie de tige d'introduction (251) puisse être introduite dans les organes à boucles (24) qui sont alignés, et la distance comprise entre les secondes faces opposées (254) étant supérieure à la distance comprise entre la face de coopération (241) et la plaque de coffrage (20) afin que celles-ci coopèrent par frottement lorsque la partie de tige d'introduction (251) est tournée après avoir été introduite.
5. Ensemble de coffrage selon la revendication 4, dans lequel la partie (251) de tige d'introduction a une section sensiblement circulaire, et les secondes faces opposées (254) ont une section convexe en direction transversale à la longueur de la partie de tige d'introduction (251).





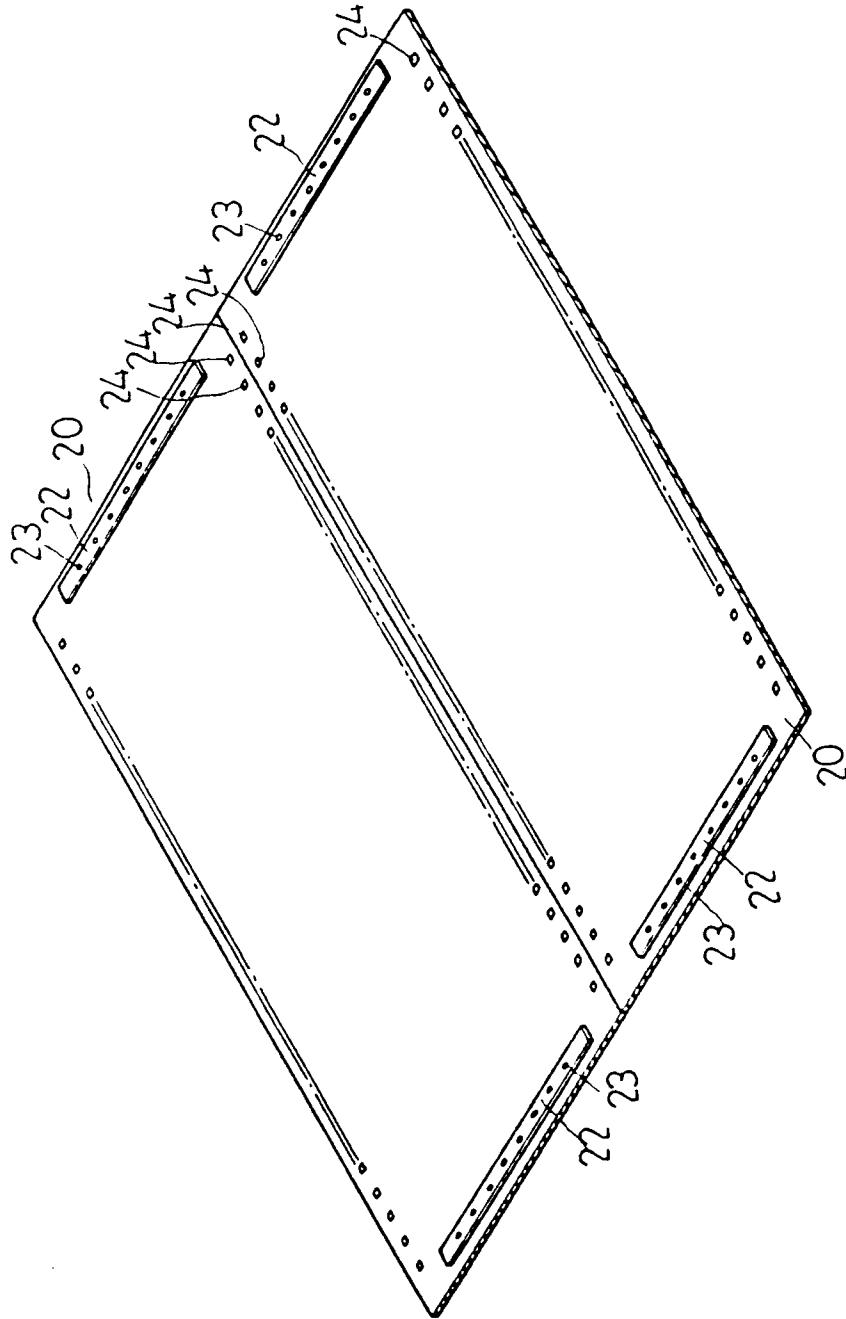


FIG. 3

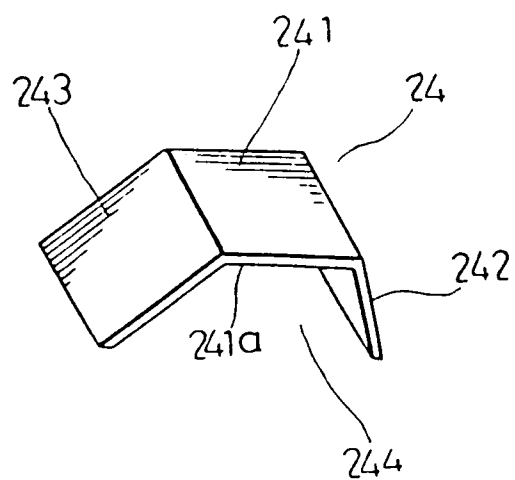


FIG. 4

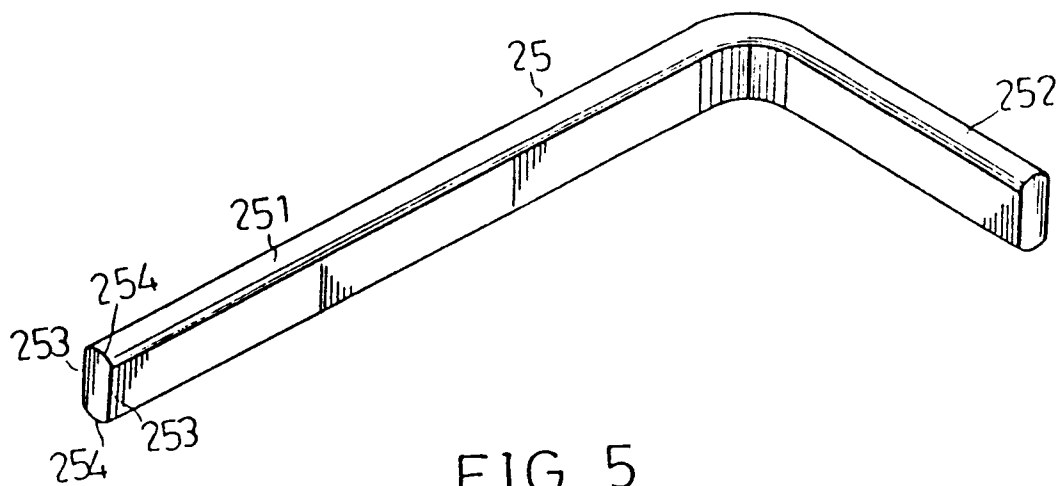
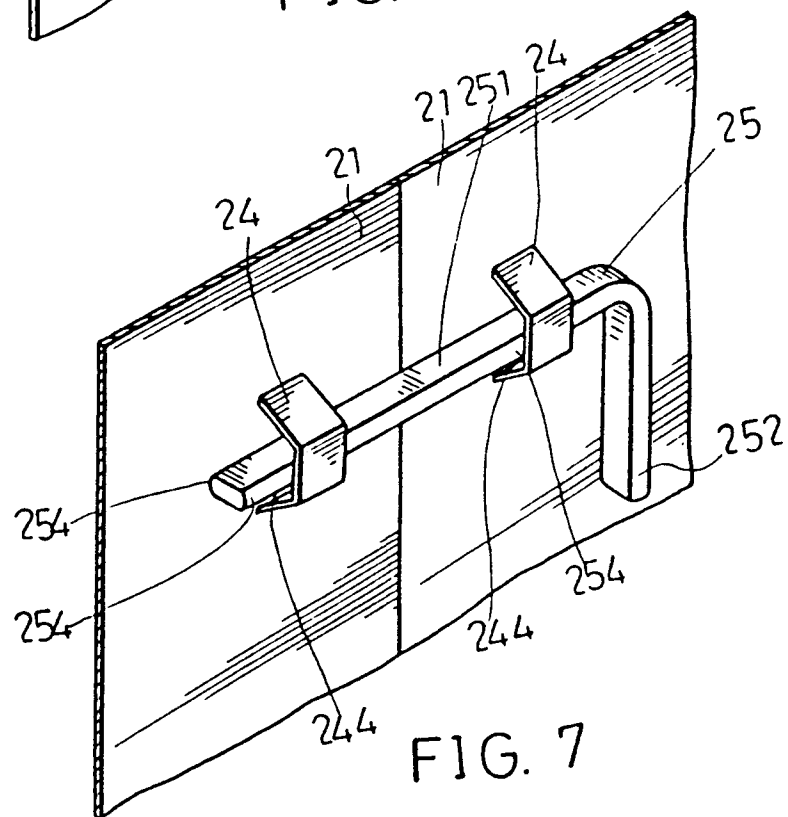
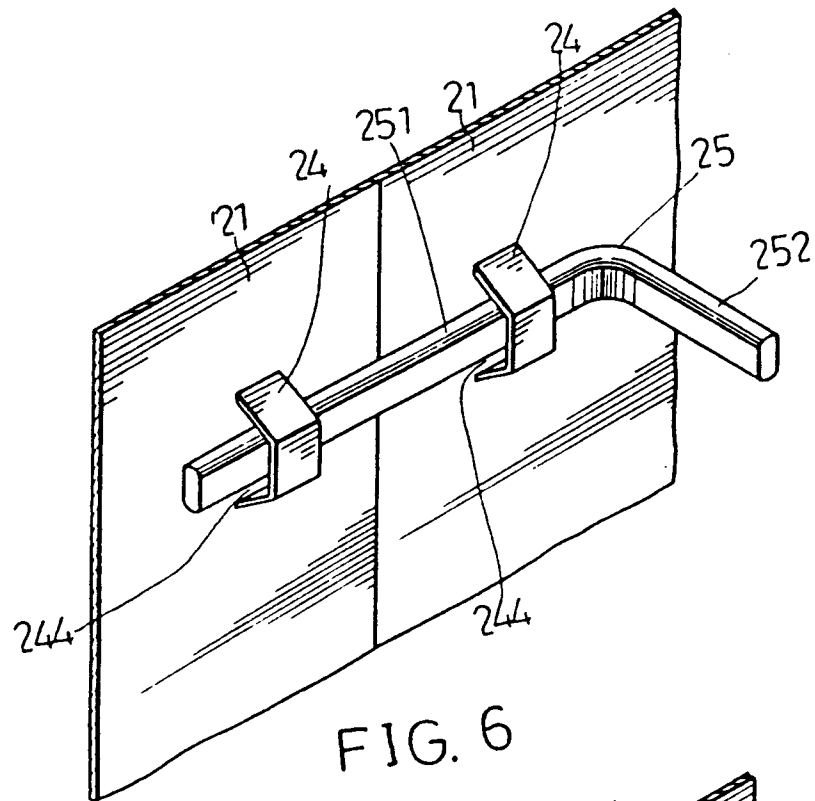


FIG. 5



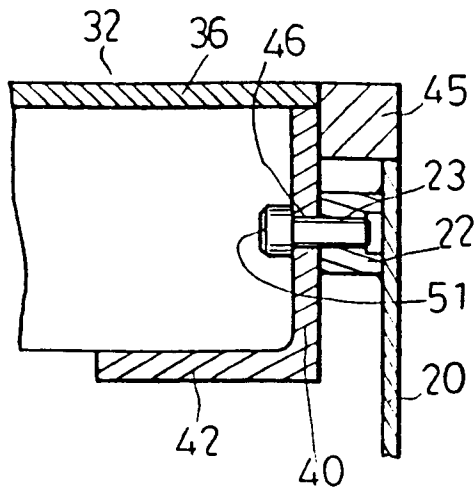


FIG. 8
(I - I)

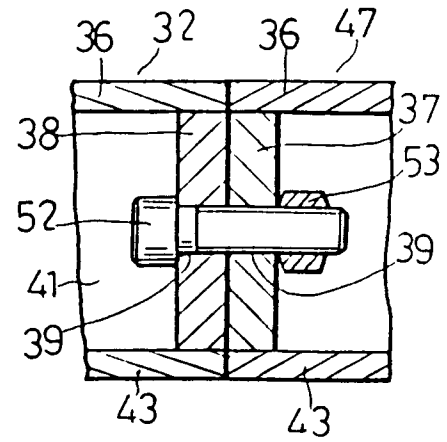


FIG. 9
(II - II)

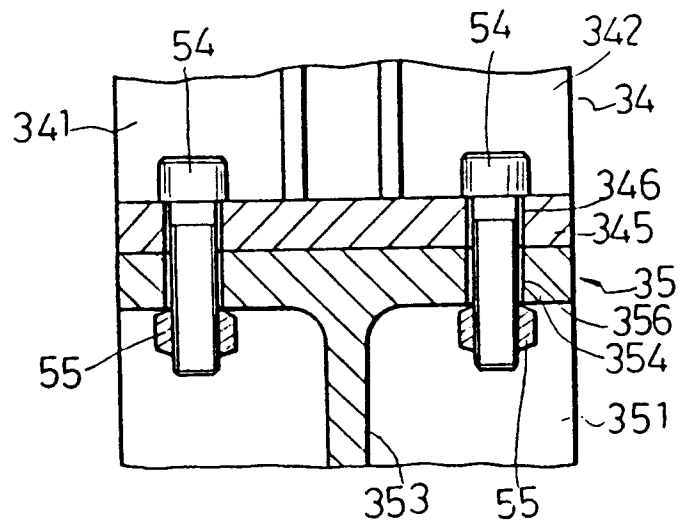


FIG. 10
(III - III)